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Gender-specific and age-specific differences in unstable angina pectoris admissions: a population-based registry study in Finland

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ABSTRACT

Objective: To evaluate gender-specific and age-specific differences in the occurrence of unstable angina pectoris (UAP) caused admissions.

Design: Population-based retrospective registry study in Finland.

Participants: All consecutive patients aged ≥30 years hospitalised with a primary diagnosis of UAP in 22 hospitals with a coronary catheterisation laboratory during 5/2000–10/2009.

Primary outcome measures: Gender-specific and age-specific differences and trends in occurrence of UAP admissions.

Results: The study period included 27 282 admissions caused primarily by UAP. Of these, 61.9% occurred to men and 38.1% to women with age-adjusted relative risk (RR) of 1.85 (CI 1.61 to 2.14) for the male gender (p<0.0001). The standardised incidence rate of UAP during the whole study was 92.8 (CI 91.8 to 93.9)/100 000 person-years. The incidence rate increased gradually from 1.3 in the population aged 30–34 years to 268.0/100 000 in the population aged 75–84 years. Men had a 2.4-fold risk for UAP admission compared with women in the general population (incidence rate ratio 2.39; CI 2.24 to 2.56; p<0.0001). Gender difference was present in all age groups. UAP caused 22.4% of acute coronary syndrome admissions and 4.7% of all cardiovascular admissions. UAP was more likely to be the cause of cardiovascular admission in male patients (RR=1.25; CI 1.21 to 1.30, p<0.0001 compared with female patients), but there was no gender difference in acute coronary syndrome admissions. The incidence rate of UAP hospitalisations in the general population declined by an estimated 8% per study-year (p<0.0001). Declining incidence was evident regardless of gender and age.

Conclusions: Men have a 2.4-fold overall RR for UAP admission compared to women in the general population. Admissions due to UAP have a declining incidence trend across the adult Finnish population.

Strengths and limitations of this study

- Characterises differences in the occurrence of unstable angina pectoris (UAP) caused admissions in different segments of the general population.
- Large-scale nationwide study using obligatory and controlled registry data from hospitals with a coronary catheterisation laboratory.
- Diagnosis of UAP was done by the treating physicians.

INTRODUCTION

Acute coronary syndrome (ACS) is a major cause of cardiovascular morbidity and mortality in the adult population.[1] ACS is divided into myocardial infarction (MI) or unstable angina pectoris (UAP). The epidemiology of MI in general and in the two subtypes, ST-segment elevation MI (STEMI) and non-ST-segment elevation MI (NSTEMI), has been described in a number of studies.[2–11] Current knowledge on the occurrence of UAP at the population level and in different population segments is, however, much more limited. Men have a higher risk of MI than women and the incidence of MI increases progressively with ageing.[5 12] The incidence of MI has been declining in a majority of western countries during recent years.[2 4 7 12 13] Whether this is true also for UAP is, however, unknown. In order to further clarify the epidemiology of UAP, we studied gender and age differences and trends in UAP occurrence in the general population.

METHODS

Study patients

We studied the rate and trends of UAP caused admissions in patients aged ≥30 years. Patients admitted to participating hospitals with UAP as the primary discharge diagnosis (International Statistical Classification of Diseases 10th Revision

(ICD-10) codes I20.0X) were included in the study. Data were collected from the Finnish Care Register for Health Care, a nationwide obligatory and automatically collected data base containing discharge data of all hospital admissions in Finland. Admissions beginning between 1 May 2000 and 31 October 2009 in any of the 22 Finnish hospitals with a coronary catheterisation laboratory that were treating emergency coronary patients were included. In addition, corresponding data of all cardiovascular admissions (primary discharge diagnosis ICD-10 code in class I) and MI admissions (I21 and I22) were collected. Gender-matched and age-matched population data of mainland Finland from the corresponding period (31 766 839 person-years) were obtained from Statistics Finland.

Statistical methods

Data were analysed by using negative binomial regression modelling. When modelling the incidence rate and proportion from cardiovascular and ACS admissions, natural logarithms of the corresponding population or number of all cardiovascular/ACS admissions were used as offset parameters. Incidence rate calculations were standardised with the direct method using the European 2013 standard population. Scale variables are presented as the mean±SD or median with IQR as appropriate. Categorical variables are presented as the percentage, relative risk (RR) or incidence rate ratio (IRR) with 95% CIs as appropriate. Poisson distribution was assumed in counting CIs for count data. p Values <0.05 were considered statistically significant. Statistical analyses were performed using SAS V.9.4 (SAS Institute Inc, Cary, North Carolina, USA).

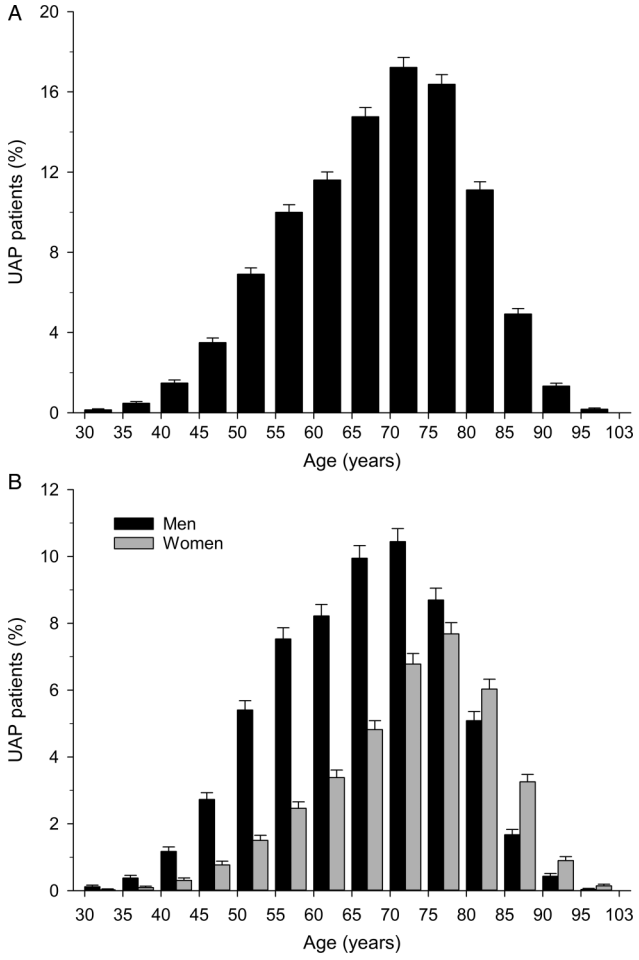

Figure 1 Frequency of unstable angina pectoris (UAP) admissions. Age distribution of all patients with UAP (A) and by gender (from the total number of patients) (B). Error bars represent upper limits of 95% CIs.

RESULTS

Frequency

The study period included 27 282 UAP admissions, of which 61.9% (CI 60.9% to 62.8%) occurred to men and 38.1% (CI 37.4% to 38.9%) to women. Overall, the age and study-year adjusted RR of a patient with UAP to be a male was 1.85 (CI 1.61 to 2.14, p<0.0001). The median age of patients with UAP was 70 years (IQR 61–77). Men with UAP were significantly younger than women (66.4 ±11.1 vs 72.3±10.8 years, p<0.0001). The number of patients increased steadily with age up to 75 years followed by a steep decline in octogenarians and older (figure 1A). Although age distribution had a similar pattern in both genders, the number of UAP admissions reached its peak at an older age in women (figure 1B).

Incidence rate

The crude total incidence rate of UAP admissions in participating hospitals was 111.3 (CI 109.6 to 113.0)/100 000 person-years. The standardised incidence rate was 92.8 (CI 91.8 to 93.9)/100 000. Among the male population, the crude incidence rate was 111.3 (CI 109.6 to 113.0) and the standardised rate 132.3 (CI 130.5 to 134.1)/100 000 while corresponding rates among the female population were 63.6 (CI 61.5 to 63.9) and 61.8 (CI 60.7 to 63.1), respectively. The total incidence rate increased gradually from 1.3 (CI 0.9 to 1.3) among the population aged 30–34 years to 268.0 (CI 257.7 to 276.8)/100 000 among the general population aged 75–84 years, followed by a decline in the older population (figure 2). The peak incidence in both genders occurred in the population aged 80–84 years (376.3; CI 356.7 to 396.6 in men and 214.6; CI 204.3 to 225.2 in women; figure 2B). Young men (30–39 years) had the highest RR for UAP admission compared to women (IRR 4.06; CI 2.76 to 5.94, p<0.0001). Gender difference in IRR for UAP reduced with ageing, although men were at higher RR at all ages (figure 3). The overall age-adjusted and study-year adjusted IRR for UAP admission was 2.39 (CI 2.24 to 2.56) among men compared to women (p<0.0001).

Annual trends

The overall incidence rate of UAP admissions declined significantly during the study period from 135.7

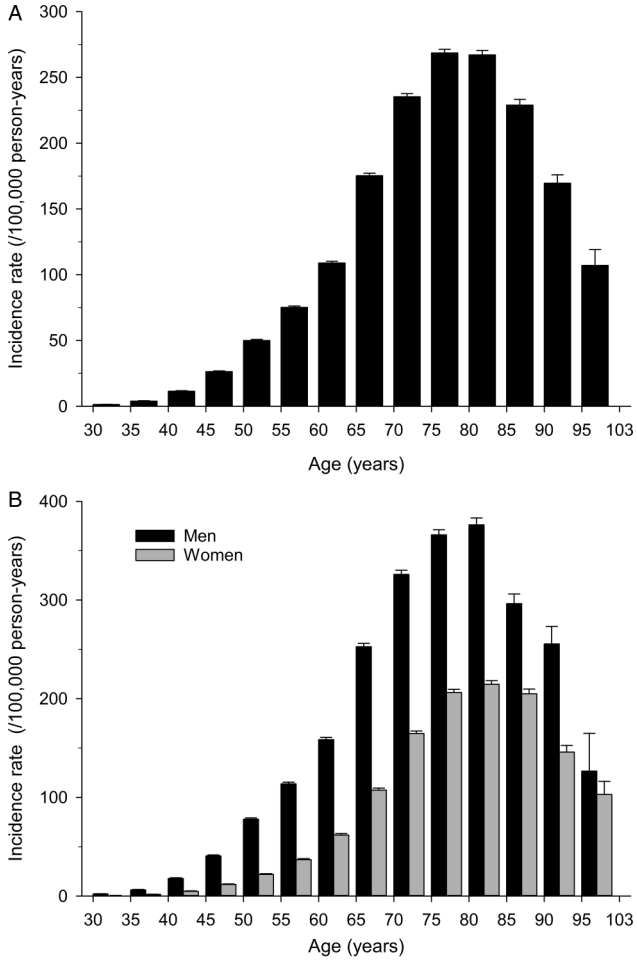

Figure 2 Incidence rate of unstable angina pectoris (UAP) admissions in the general population. Total (A) and gender specific (B) incidence rates (per 100 000 person-years) of UAP by age. Error bars represent upper limits of 95% CIs.

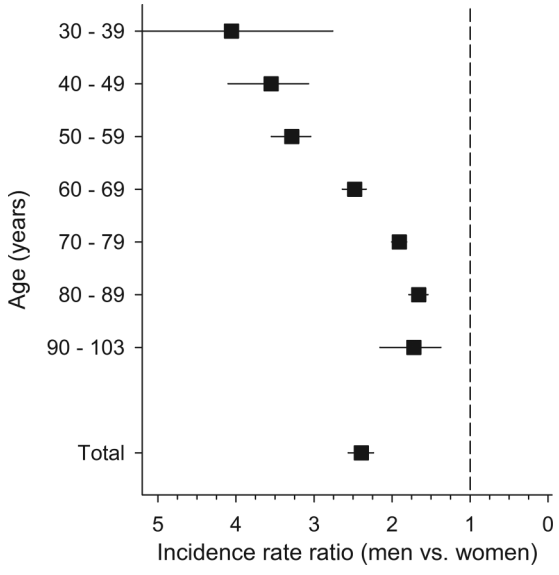

Figure 3 Gender-associated likelihood for unstable angina pectoris admissions in general population by age. The incidence rate ratio is calculated as men versus women and adjusted for study-year. Error bars represent 95% CIs.

(CI 130.9 to 140.7)/100 000 in 2000 to 63.9 (61.0 to 66.9)/100 000 in 2009, with an estimated annual trend of −8.0% (−9.0% to −6.9%). The trend in UAP incidence was similarly declining in men and women (figure 4 and table 1). Incidence had a declining trend also in all age groups (figure 4). Although the largest absolute reduction in incidence of UAP was present in the oldest age groups, the percentual decrease was most prominent in patients aged 30–39 years (table 1).

Proportion of admissions

UAP was the primary cause in 4.7% (CI 4.6% to 4.7%) of all cardiovascular admissions. The proportion of UAP admissions increased gradually with ageing from 1.0% to 5.0% in patients aged 50–54 years (figure 5). In the patient population aged 50–74 years, the proportion of UAP admissions remained stable, followed by a gradual decrease to 2.1% in the oldest cardiovascular patients (figure 5A). In male cardiovascular patients, 5.1% (CI 5.0% to 5.1%) of admissions were primarily due to UAP while a corresponding proportion was 4.1% (CI 4.0% to 4.1%) in female patients. Overall, the RR for UAP admission was 1.25 (CI 1.21 to 1.30) among male

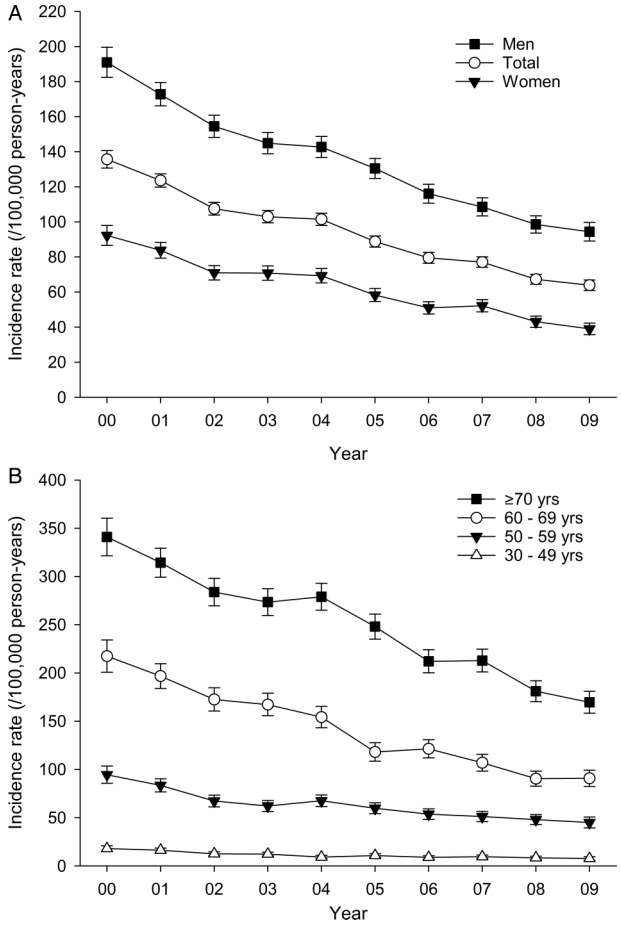

Figure 4 Annual trends for unstable angina pectoris admissions. Incidence rates are presented by gender (A) and by age groups (B). Total and gender-specific rates (A) are standardised. Error bars represent 95% CIs.

Table 1 Estimated annual incidence trends of unstable angina pectoris admissions in Finland during 2000–2009

Group	Annual change (%)	95% CI (%)	p Value
Total	−8.0	−9.0 to −6.9	<0.0001
Gender			
Men	−7.6	−9.1 to −6.1	<0.0001
Women	−8.3	−9.9 to −6.7	<0.0001
Age (years)			
30–39	−12.6	−17.5 to −7.4	<0.0001
40–49	−7.8	−9.9 to −5.6	<0.0001
50–59	−8.0	−9.1 to −6.8	<0.0001
60–69	−9.6	−10.5 to −8.6	<0.0001
70–79	−8.4	−9.2 to −7.5	<0.0001
≥80	−5.6	−5.6 to −4.4	<0.0001

cardiovascular patients compared to female patients (p<0.0001). Gender difference was more pronounced in the youngest patients, after which RR remained stable (figure 6). The gender difference in the risk of UAP was notably smaller among hospitalised cardiovascular patients (figure 6) than in the general population (figure 3).

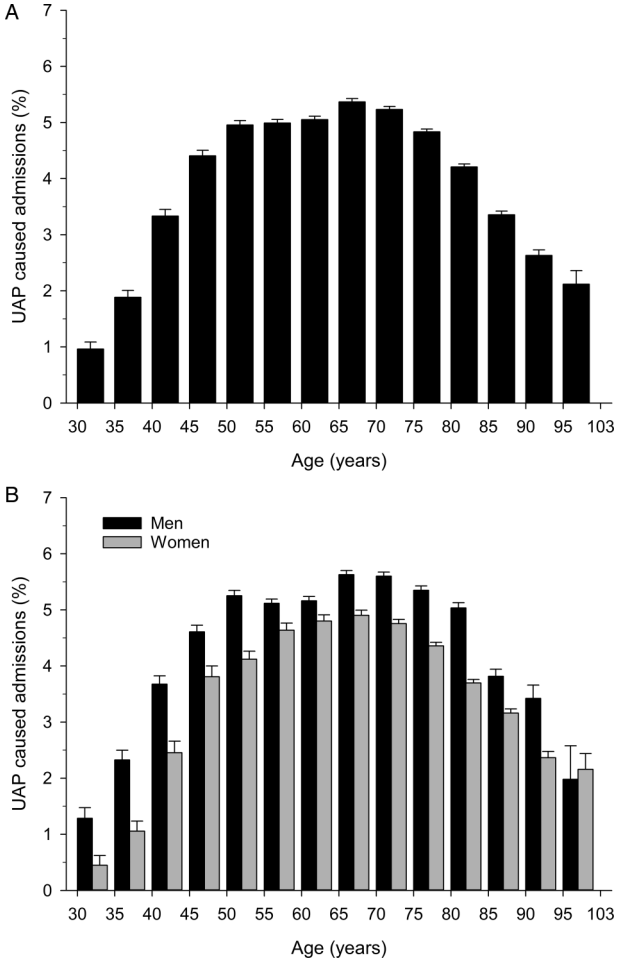

Figure 5 Proportion of cardiovascular admissions caused primarily by unstable angina pectoris. Total (A) and gender-specific rates (%) (B) by age. Error bars represent upper limits of 95% CIs.

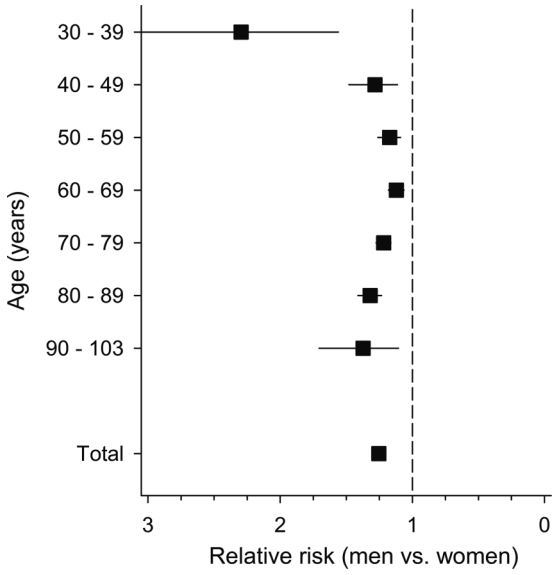

Figure 6 Gender-associated risk for unstable angina pectoris caused cardiovascular admission by age. Relative risk is calculated as men versus women and adjusted for study-year. Error bars represent 95% CIs.

Of all ACS admissions, 22.4% (CI 22.1% to 22.6%) were caused by UAP. The proportion increased gradually from 18.1% in the youngest patients to 27.5% in patients aged 60–70 years, followed by a steeper decline to 9.4% in non-agenarians and older (figure 7). ACS admission was due to UAP in 30% of patients in 2000, but the proportion declined to 21.7% in 2003 while remaining more plateaued thereafter (figure 7). UAP caused 23.0% (CI 22.6% to 23.3%) of ACS admissions among men and 21.5% (CI 21.1% to 21.9%) in women, but after adjustment for age and study-year, there was no difference between genders (p=0.14).

DISCUSSION

This multihospital study describes the occurrence of UAP admissions in different segments of the general population. Although epidemiology of MI has been explored in a number of studies, much less is known of UAP.

Men are known to have a higher risk of MI than women.[5 12] However, data on potential gender differences regarding the occurrence of UAP have been scarce. A French registry of UAP admissions reported 71.2% of patients to be men,[14] while in an Australian study the proportion was 60.2%.[15] In smaller studies, male predominance in patients with UAP has ranged from 83.9%[16] to 56.6%.[17] Potential gender differences in the risk of UAP in the general population have not, however, to the best of our knowledge, been previously explored. We found 61.9% of patients to be men. Furthermore, men had a 2.4-fold overall risk for UAP admission in the general adult population compared to women. Curiously, this is exactly the same gender-based risk difference that was previously found for NSTEMI,[12]

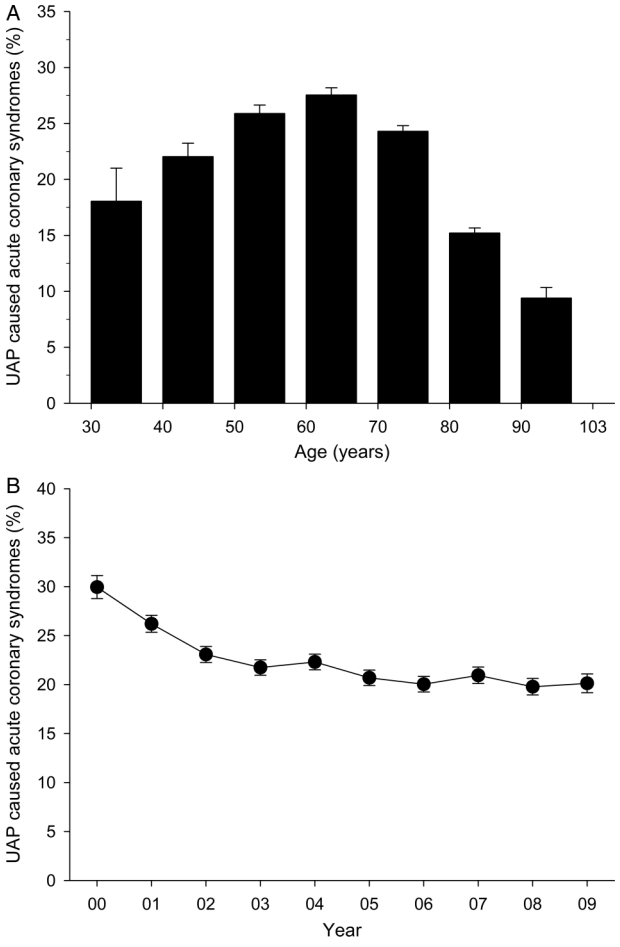

Figure 7 Proportion of unstable angina pectoris (UAP) within acute coronary syndrome admissions. UAP caused ACS admissions by age (A) and by study-year (B). Error bars represent 95% CIs.

while the RR for STEMI was 25% higher among men in the Finnish population.[5] The gender bias in risk of UAP was most prominent in the youngest population in our study, and although gender difference was reduced with increasing age, men had a higher risk in all age groups. This is in line with a previous smaller Japanese study reporting more pronounced excess of men among UAP patients under 66 years of age.[18] In addition, we found men to be more likely (1.3-fold) to have UAP as the cause of cardiovascular hospital admission than women. Although gender difference in the proportion of UAP caused cardiovascular admissions was less than found in the incidence, it was also present in all age groups. Within patients with ACS, however, we found no gender difference in the proportion of UAP caused admissions. Regional differences in the presentation of ACS seem, however, to be apparent, as UAP constitutes 45% of female patients and 23% of male patients with ACS in Middle Eastern countries.[19]

Previous studies have reported a mean age of 66–67 years for patients with UAP,[14 17 18] which is slightly less than 70 years found in our data. Female patients with UAP were on average 6 years older than male patients in our study population, comparably to previous findings in UAP[15] and MI.[12] The proportion of UAP within ACS admissions was, however, age dependent in our study population, as the proportion increased gradually to patients aged 60–70 years followed by a steep decline with increasing age. This result is likely to reflect age differences in the prevalence of stable coronary artery disease,[1] but may also suggest potential age-dependent differences in the pathophysiology of ACS. A decreasing proportion of UAP among ACS admissions in the elderly is likely to be affected by the study design, that is, only patients admitted to hospital were included.

The incidence of STEMI has been declining in a majority of Western countries during recent years,[2 4 20 21] while reports on the incidence trend of NSTEMI have been conflicting.[2 12 20 22] We found a significant 8% annual decline in UAP incidence in the general population. Notably, a declining trend was similar in both genders and across all age groups. Only a few previous studies have reported on trends of UAP incidence. In the USA, the incidence of UAP among Medicare beneficiaries has a declining trend comparable with that of our findings.[23] In Western Australia, however, the decline in UAP admissions has been significantly slower (3% per annum).[15]

Our study is limited by the retrospective nature of administrative registry data. The general accuracy of a used nationwide, obligatory and automatic registry is, however, good[24] and administrative hospital data have proved to be a reliable source of information on the occurrence of ACS.[25 26] Diagnosis of UAP was made by treating doctors and data on used diagnostic tests such as troponin measurements were not available. In order to optimise the balance between diagnostic accuracy and representativeness of the study population, we included only patients who were admitted to a hospital with a coronary catherisation laboratory, thus excluding patients treated in smaller local hospitals. Overall, the incidence rates of UAP admissions found here are thus likely to underestimate the overall incidence rate of UAP, but are representative of patients considered to be in the scope of invasive treatments.

In conclusion, men have a 2.4-fold overall RR for UAP admission compared to women. Gender bias in UAP risk is highest among younger adults. UAP has a declining incidence trend across all segments of the adult Finnish population.

Contributors VK, JS and PR designed the study. VK and JS collected the data. VK conducted the analyses, all contributed to the interpretation of the results and VK drafted the manuscript. All authors accepted the final version of the manuscript.

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Competing interests None declared.

Ethics approval The study was approved by the National Institute for Health and Welfare (permission number THL/1576/5.05.00/2010).

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No additional data are available.

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